

Ore Knob Mine, Ashe County, NC

National Risk-Based Priority Panel Briefing
Loften Carr, RPM March 2015



Ore Knob, NC

Located in Laurel Springs, near
Jefferson, Ashe County,
North Carolina

Ore Knob Mine Site History

Former Copper Mine located in Ashe
County, NC

Mine operated intermittently from 1855
until 1962

Largest Copper Producer in NC

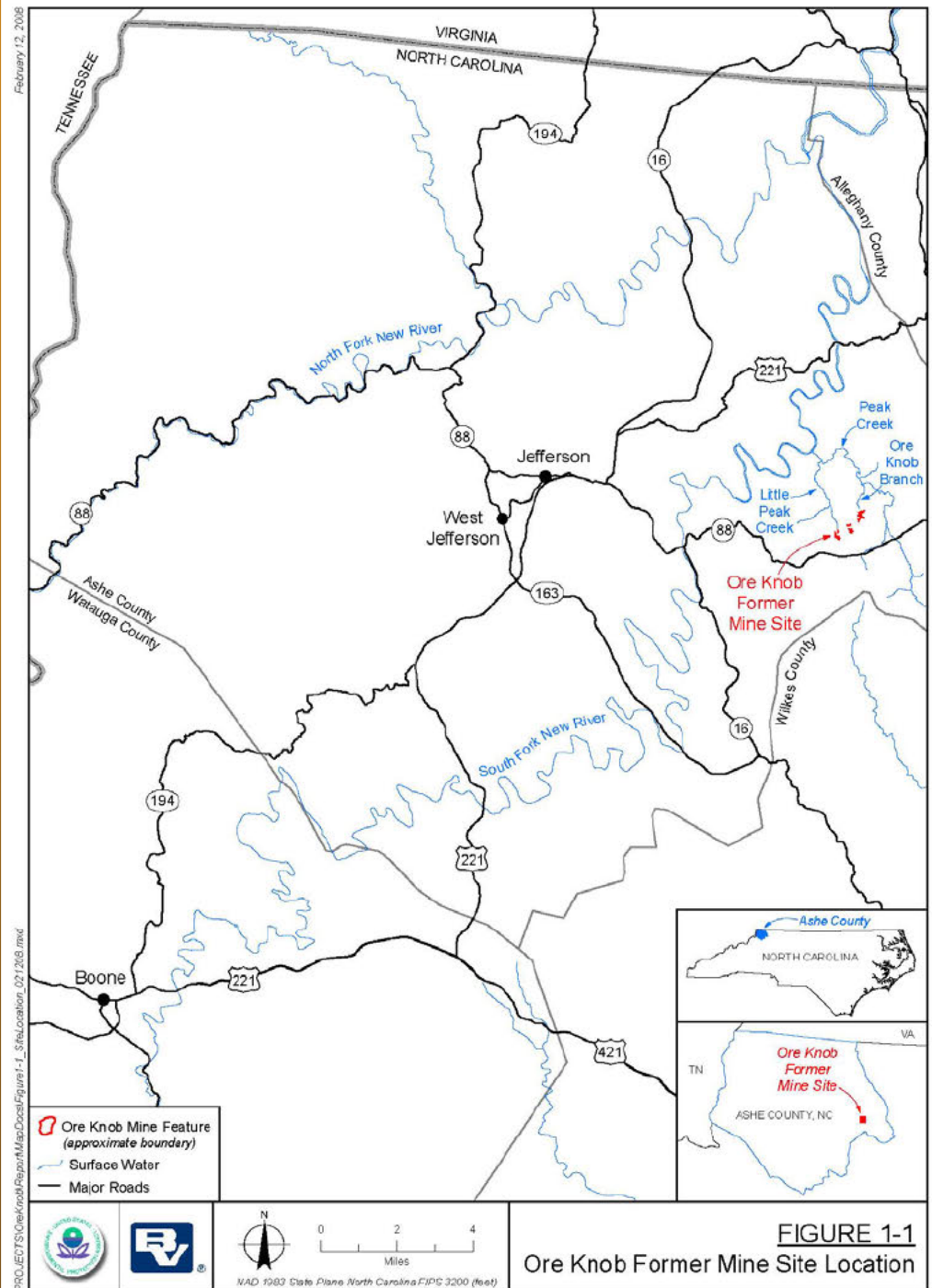
Massive Sulfide Deposit produced:

31,000 tons of Copper

9,400 ounces of Gold

145,000 ounces of Silver

From 1,500,000 tons of Ore



Ore Knob, NC

3 Site Areas:

1957 – 1962 Mill Site

19th Century Operations Area

Tailings Impoundment

4 Impacted Sub-Watersheds:

Ore Knob Branch

Peak Creek

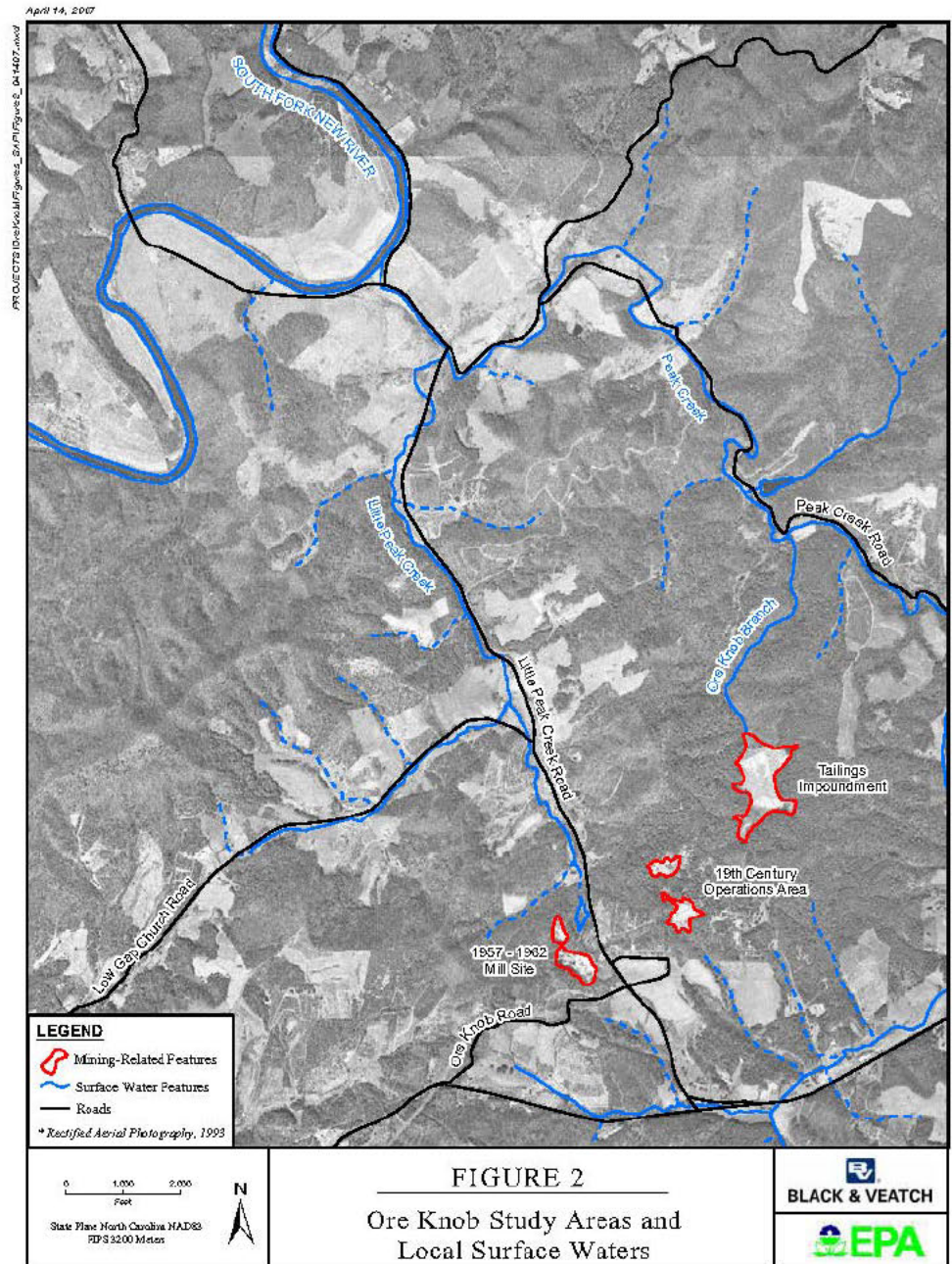
Little Peak Creek

South Fork New River

Private Wells Impacted :

Underground Mine Works

Tailings Pond ?



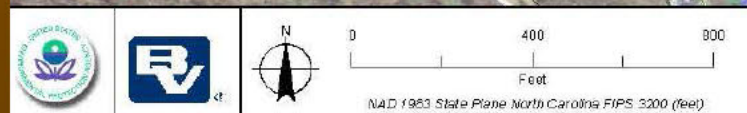
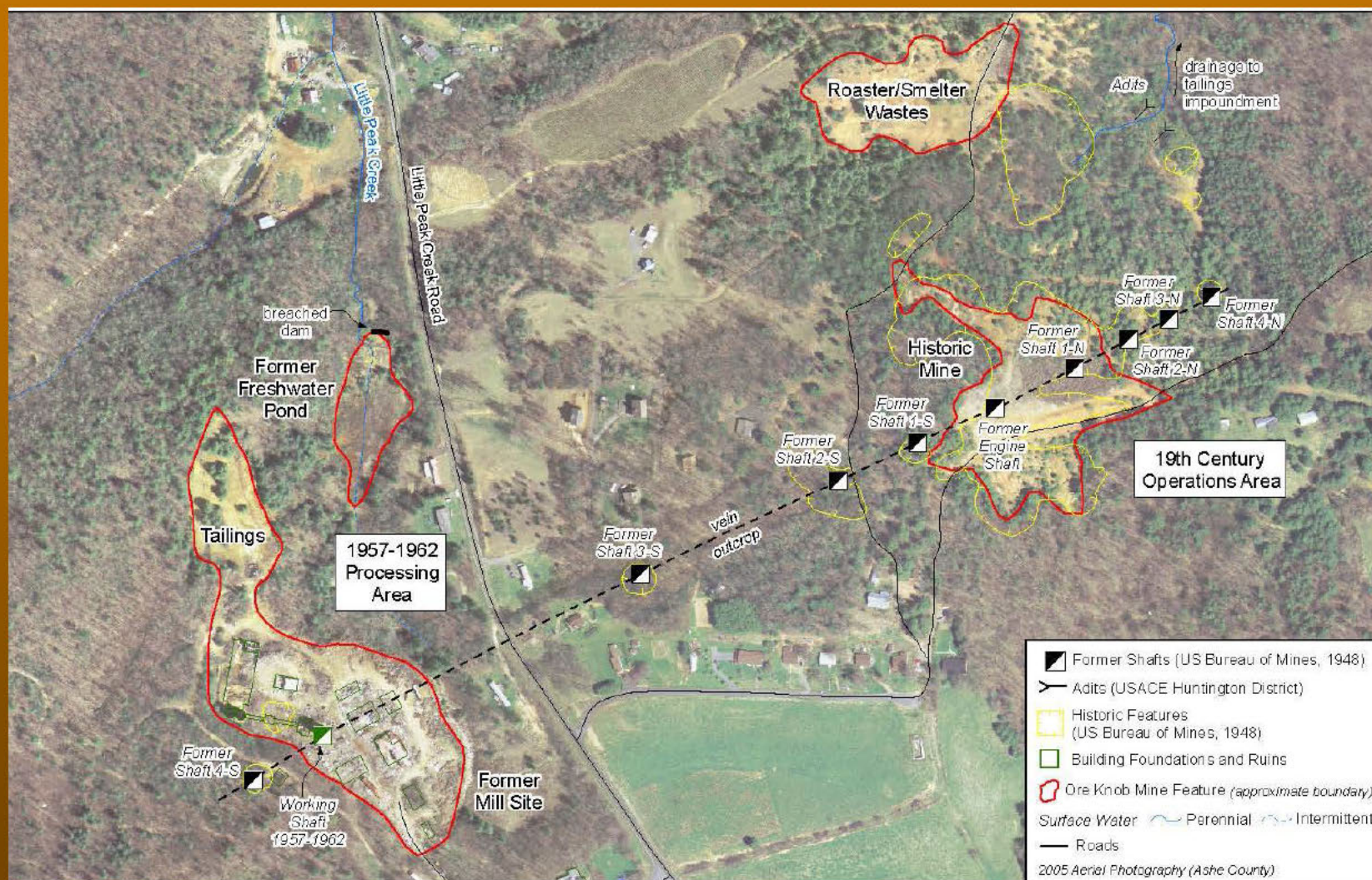


FIGURE 2-2
Historic Features in the 19th Century Operations and Former Mill Site Areas

Tailings Impoundment (Before Removal Action)



Tailings Impoundment (Removal Action Complete)



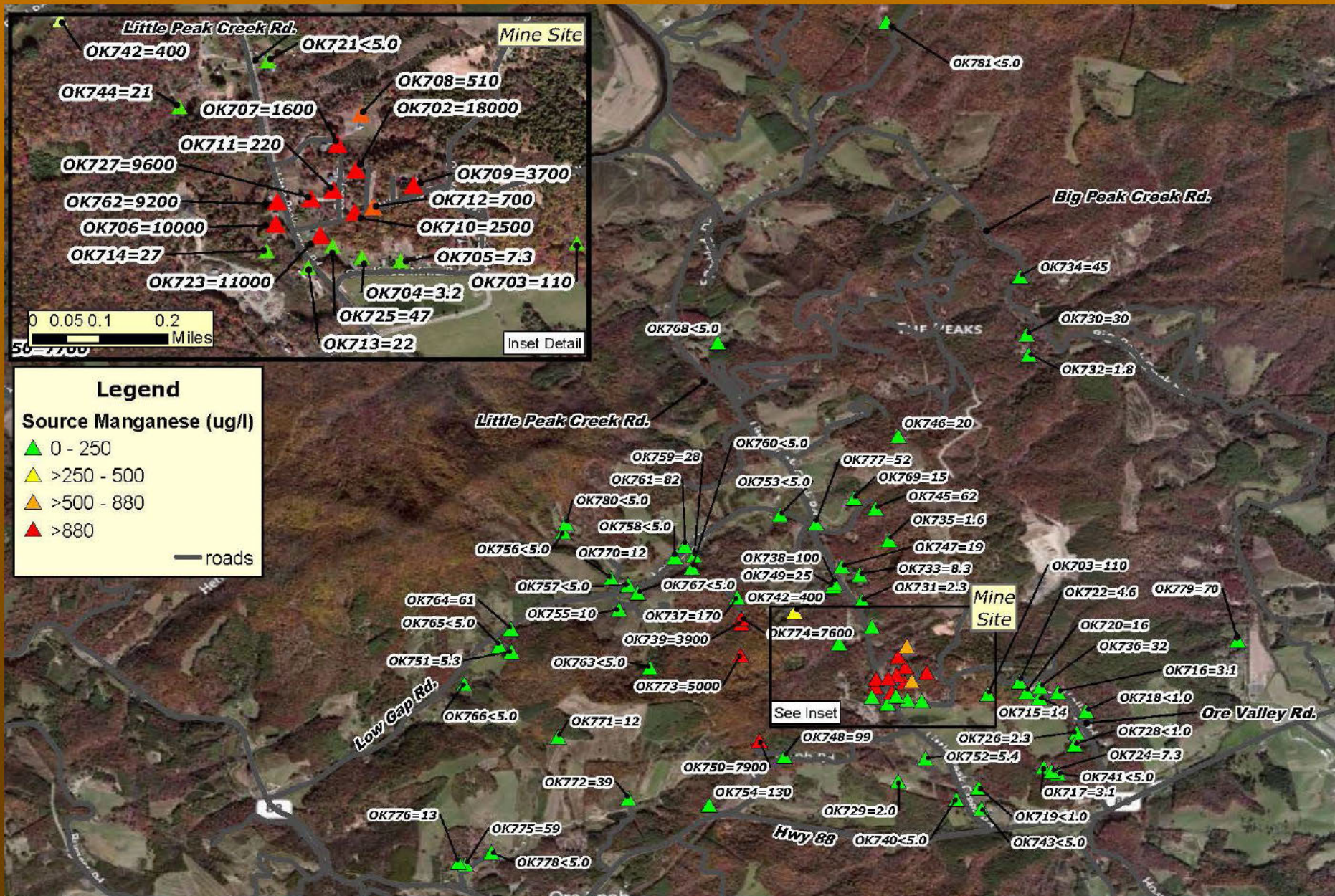
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Site History

- 2007 - EPA conducted a site wide ESI
 - Collected 7 Potable well samples
- 2008 - 2011 - Time Critical Removal Action stabilized the Main Tailings Pond (\$6.2 Million)
- 2009 Site Final On NPL
- April 2010 - Determined several potable wells exceeded health based benchmarks for Manganese and Cobalt
- April 2010 - June 2012 –EPA SESD/SRSEB sampled 79 potable water sources (64 private wells and 15 Springs)
 - EPA Emergency Response provided bottled water and installed or upgraded 10 whole house treatment systems.
- June 2013 - EPA signed EECA Approval Memo
- February 2015 – Completed Final EECA and approved NTCR Action Memo for Drinking Water

Manganese Exceedances

14 Contaminated Potable Wells, 1 Potable Well of Concern, 0 Contaminated Springs











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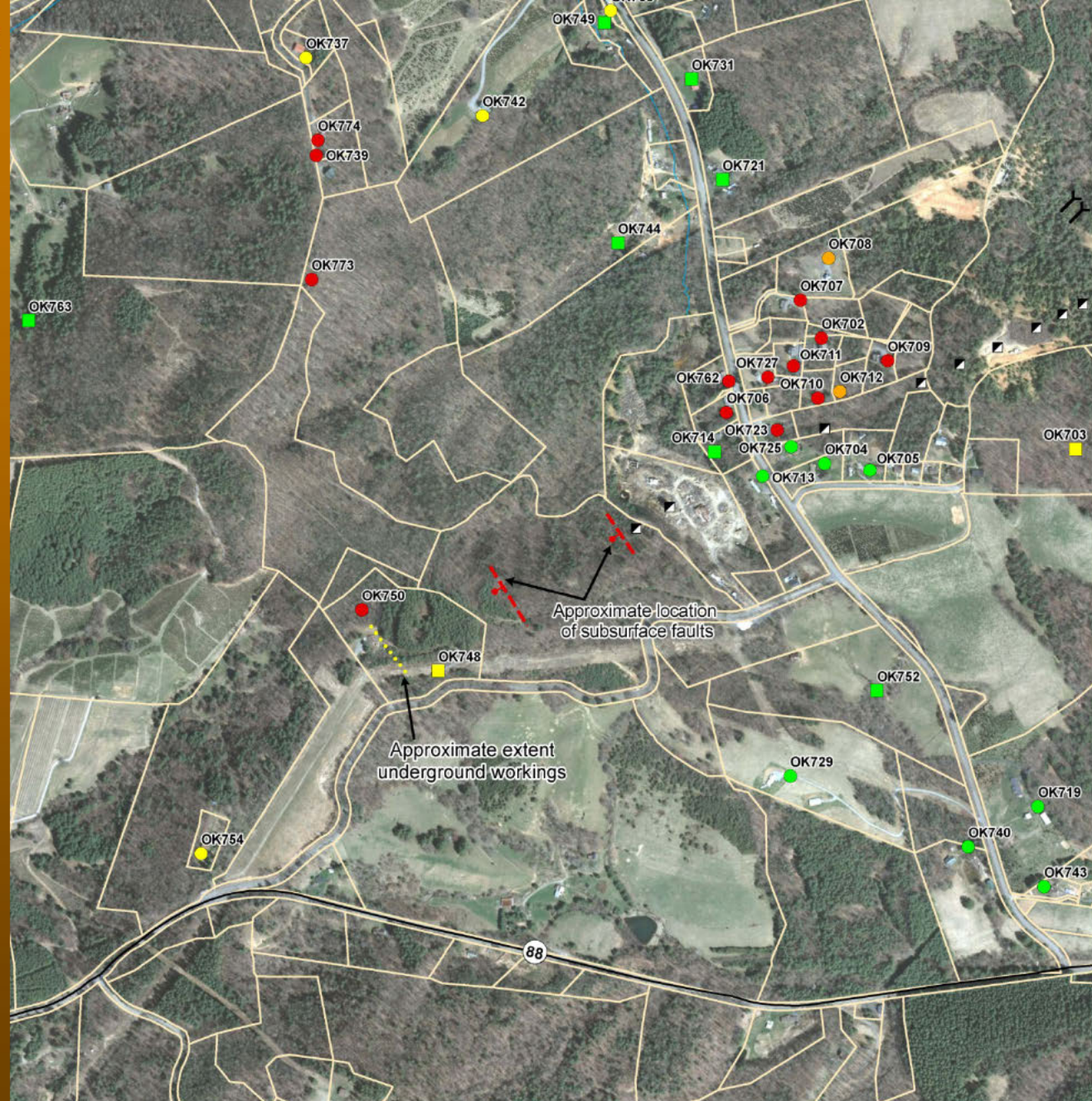
Extent of Contamination

Manganese Exceedances

Concentration

Wells	Springs
	 0-49 ug/L
	 50-439 ug/L
	 440-879 ug/L
	 880+ ug/L

50 ug/L is the
secondary MCL for
Mn



Spatial Reference: NAD 1983 StatePlane North Carolina FIPS 3200 Feet
Imagery: 2010 North Carolina Statewide Digital Orthoimagery Project



Drinking Water Sample Locations
Manganese Concentrations
Ore Knob Mine, Ashe County, North Carolina

Figure
2-7

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Extent of Contamination

Cobalt Exceedances

Concentration

Wells



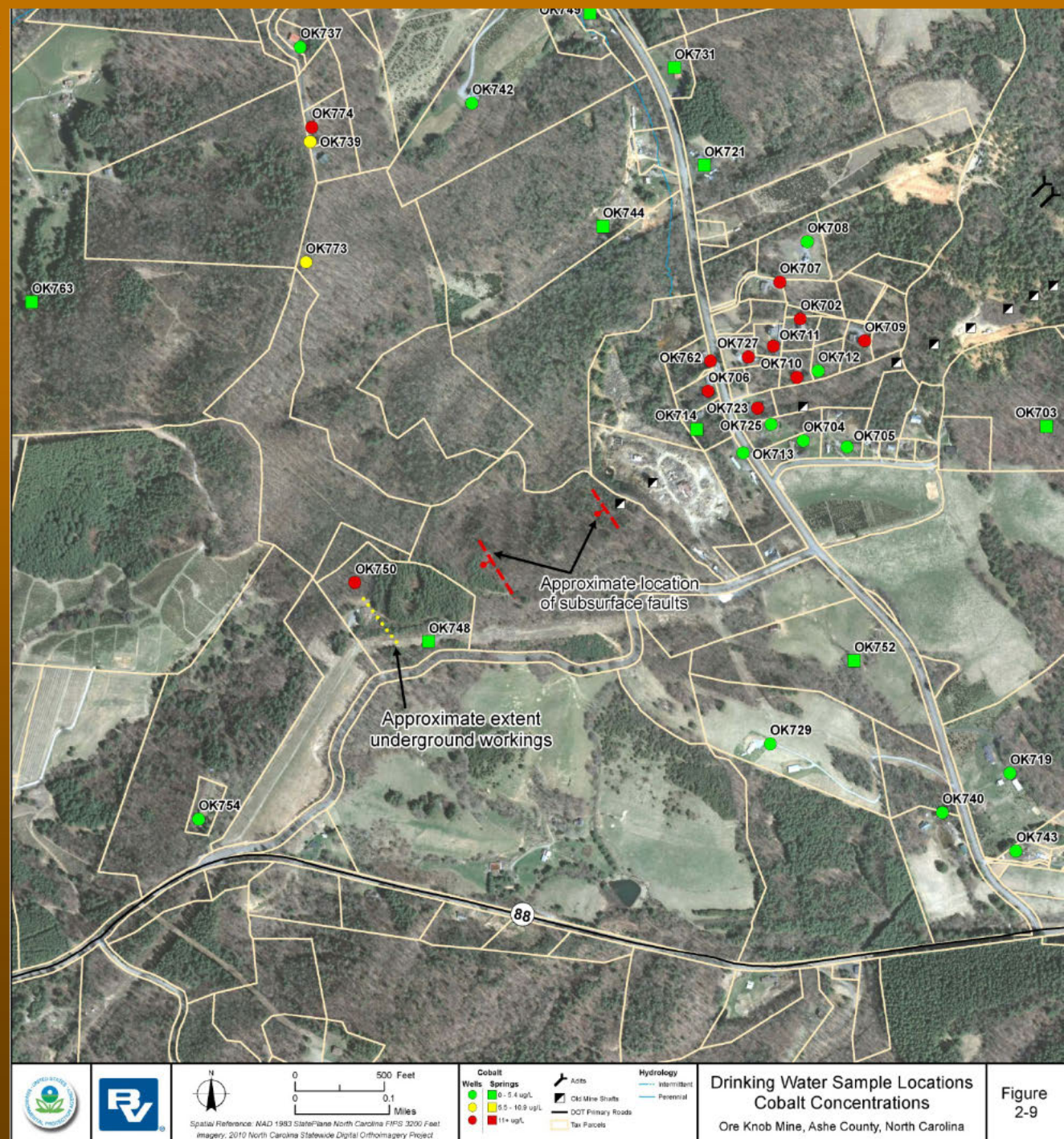
Springs



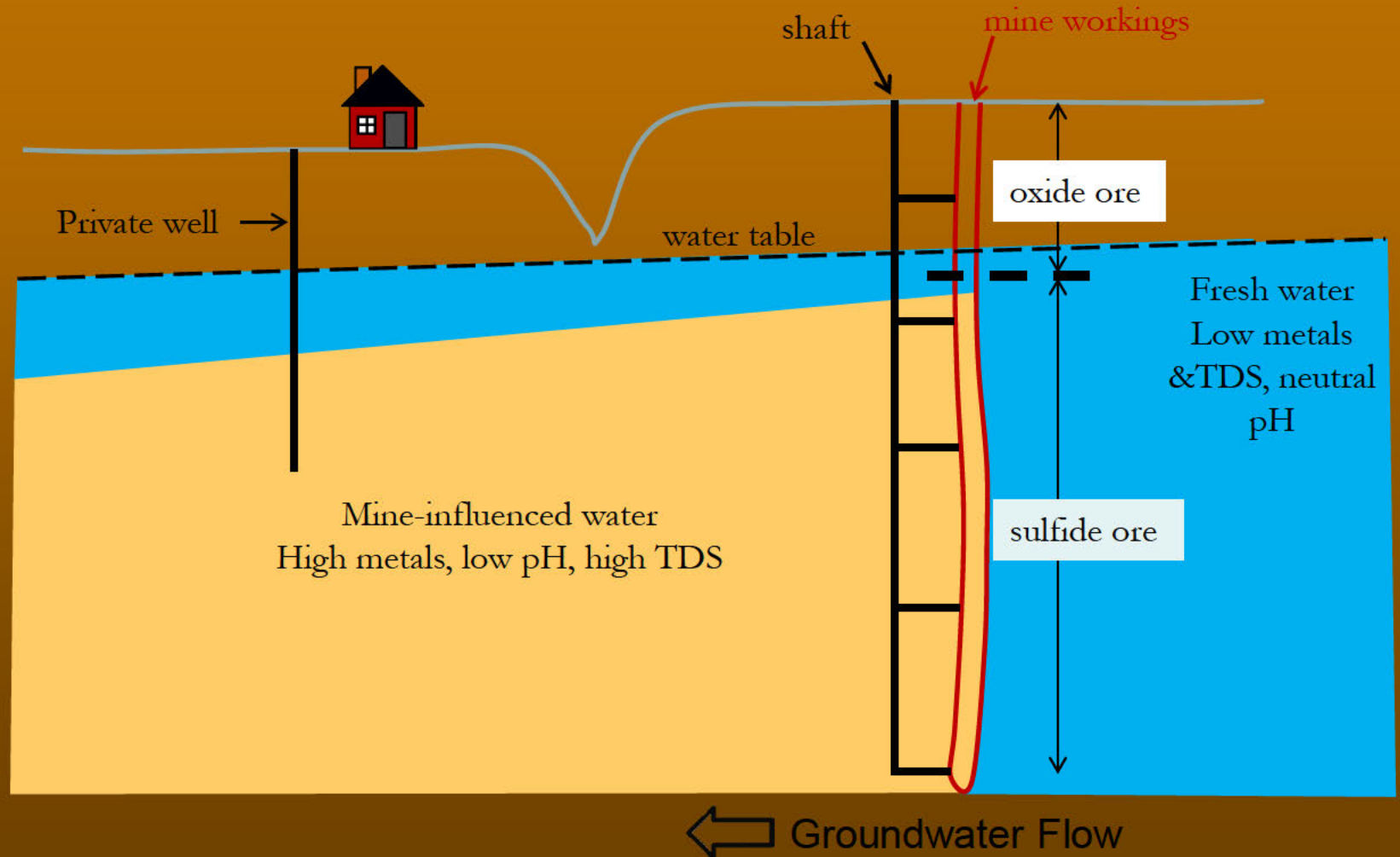
0 - 5.4 ug/L

5.5 - 10.9 ug/L

11+ ug/L



Conceptual Hydrogeological Model of Underground Mine Pool and Local Fractured Rock Aquifer



RME Human Health Risk Assumptions

- **Current and Future Resident exposure through**
 - Ingestion
 - Inhalation and/or dermal exposure while showering
- **30 year exposure period @ 350 days per year**
 - Child (1 to 6 yrs) – 6 year exposure duration
 - Adult – 24 year exposure duration
- **Analytical results used for exposure point concentrations**
- **Both untreated and treated water evaluated where point of entry treatment is being used**

RME Human Health Risk Results

- COPCs detected in:
 - 29 of 65 private wells
 - 2 of 16 private springs
- At 15 private wells, total HI > 1 for adult and/or child
- Exposure to Co, Mn, Fe predominates risk; Cu presents minor risk
- Existing wellhead treatment systems reduce calculated total HI to acceptable levels *when properly functioning*
- Total cancer risk is below threshold for all lifetime residents

RME Human Health Risk

Example of Some Results

Location	Who	Noncancer HI	COCs Contributing to Risk
OK702	Child	83	Mn > Co
	Adult	36	
OK706	Child	50	Mn > Co > Fe
	Adult	21	
OK707	Child	10	Co > Mn
	Adult	5	
OK708	Child	3	Mn = Fe
	Adult	1	
OK709	Child	43	Co > Mn > Cu
	Adult	19	

Removal Action Goals

Contaminant of Concern	Range of Measured Concentrations in Untreated Ground Water	Basis for Removal Action Goal	Removal Action Goal
Cobalt	0.1U - 160 µg/L	Risk based HQ=1	11 µg/L
Copper	0.87 - 3,800 µg/L	MCL	1,300 µg/L
Iron	35.1 - 42,000 µg/L	Risk based HQ=1	26,000 µg/L
Manganese	1U - 18,200J µg/L	Risk based HQ=1	880 µg/L

EE/CA Purpose Evaluate Alternative Potable Water Supply

EE/CA Alternatives:

1. No Action
2. Point-of-Entry Treatment System
3. Community Water Supply System
4. Waterline Extension from Jefferson, NC



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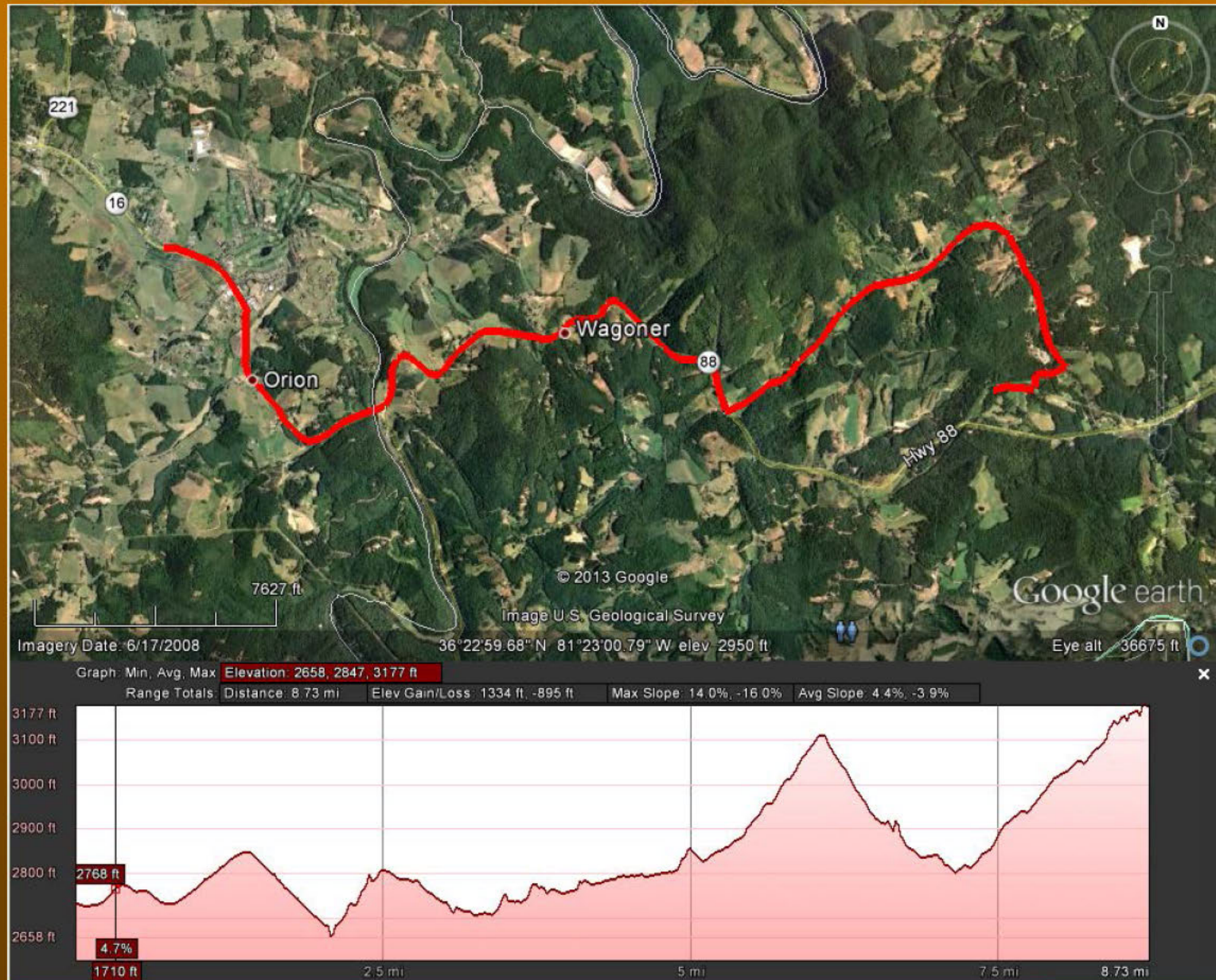
Preferred Alternative – Municipal Water Supply

- This alternative would extend the City of Jefferson municipal water supply ~ 8 miles to the 15 homes where private water supplies exceed the RGs for at least one COC.



Ore Knob, NC

Alternative 4 – Potential Water Line Route



Alternative 4 – Municipal Water Supply – Evaluation

- Highest Capital Cost up front, Most permanent option of alternatives
- Lowest Annual O & M and Long Term Cost
- City of Jefferson, NC assumes responsibility for O&M
- Very Protective of HH - Contaminated water NOT used as the supply source; completely eliminates HH threat of mine influenced water
- Low cost to users (est \$65/ month, + per gallon rate)

Table 6-2. Summary of Capital, Operations & Maintenance, and Present Worth Costs for Drinking Water Alternatives at the Ore Knob Mine Site

Alternative		Capital Cost	Average Total Annual O&M Cost	Monthly O&M Cost/Home ¹	Present Worth Cost (7% Discount Rate)
1	No Action	\$0	\$0	\$0	\$0
2A	Point-of-Entry Treatment	\$43,200	\$85,640	\$476	\$1,096,000
2B	Point-of-Entry Treatment with Bottled Water	\$45,500	\$186,200	\$1,034	\$2,346,000
2C	Point-of-Entry Treatment with Reverse Osmosis	\$64,800	\$153,200	\$851	\$1,951,000
3A	Community Water for 15 Homes	\$4,673,200	\$23,600	\$131	\$4,966,000
3B	Community Water for 30 Homes	\$5,194,000	\$43,200	\$120	\$5,730,000
4	Public Water - Moderate Estimate	\$10,187,000	\$11,749	\$65	\$10,333,000
4	Public Water - Conservative Estimate	\$13,994,400	\$11,749	\$65	\$14,140,000

¹ 15 homes for all alternatives except 3B = 30 homes

Action Memorandum for NTCRA Alternative 4 – Municipal Water Supply

- Community Acceptance – Community prefers Alternative 4 – Municipal Water Supply because it is permanent and effective long-term solution for residents with contaminated water
- Past and Future Expenditures – EPA spent \$6.2 Million on Tailings Pond TCR; **Exemption 5 - DP**
- Ground Water – This decision significantly impacts future groundwater remedial decisions



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QUESTIONS ?
DISCUSSION ?

